

<b>DATA ITEM DESCRIPTION</b>		FORM APPROVAL OMB NO 0704-0188	
1. TITLE Geophysical Investigation Plan		2. IDENTIFICATION NUMBER OT-005-05	
3. DESCRIPTION / PURPOSE To provide details of the approach, methods, and operational procedures to be (1) documented as part of the Ordnance and Explosives (OE) project work plan and (2) employed to perform geophysical investigations at OE sites.			
4. APPROVAL DATE (YYMMDD) 990825	5. OFFICE OF PRIMARY RESPONSIBILITY CEHNC-ED-CS-G	6a. DTIC APPLICABLE	6b. GIDEP APPLICABLE
7. APPLICATION / INTERRELATIONSHIP This Data Item Description contains instructions for preparing Work Plan chapters addressing geophysical investigations.			
8. APPROVAL LIMITATION	9a. APPLICABLE FORMS	9b. AMSC NUMBER	
10. PREPARATION INSTRUCTIONS  <b>GEOPHYSICAL INVESTIGATION REQUIREMENTS</b>  10.1 Unexploded Ordnance (UXO) Safety. During all initial fieldwork and all intrusive activities, the geophysical crew shall be accompanied by a UXO Technician II. The UXO Technician II shall conduct visual surveys for surface ordnance prior to the survey crew entering an area potentially containing UXO, and a magnetometer or electromagnetic survey of each intrusive activity site to ensure the site is anomaly free prior to the crew setting monuments of driving stakes. The UXO Technician II will not be required on a full time basis for most of the project, for non-intrusive activities.  10.2. Personnel Qualifications. All geophysical investigations shall be managed by a qualified geophysicist meeting the qualification requirements listed in DID OT-025.  10.3 Geophysical Investigation Plan Outline. The Contractor shall prepare a geophysical investigation plan, in accordance with the following outline:  10.3.1 Site Description <ul style="list-style-type: none"> <li>· Geophysical Investigation Program Objectives</li> <li>· Specific Area(s) to be Investigated, including a map</li> <li>· Past, current and future use</li> <li>· Anticipated UXO type, composition and quantity</li> <li>· Depth anticipated</li> <li>· Topography</li> <li>· Vegetation</li> <li>· Geologic conditions (including bedrock type, mineralization and depth)</li> <li>· Soil conditions (including soil type/composition, typical moisture content, and thickness)</li> <li>· Shallow groundwater conditions (including depth, mineralization, existence of perched tables, and seasonal &amp; tidal variations)</li> <li>· Geophysical conditions, including background geophysical gradients</li> <li>· Site Utilities</li> <li>· Man-made features potentially affecting geophysical investigations</li> <li>· Site-specific dynamic events such as tides, unusually strong winds, or other unusual factors affecting site operations</li> <li>· Overall Site Accessibility and Impediments</li> <li>· Potential Worker Hazards</li> </ul>			
11. DISTRIBUTION STATEMENT			

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### 10.3.2 Geophysical Investigation Methods

- Equipment
- Procedures
- Personnel
- Production Rates
- Data Resolution, or line/grid width requirements
- Data density
- Data Processing

### 10.3.3 Location Surveying, Mapping & Navigation

- System Description
- If GPS systems are used, correlate satellite availability with work/rest periods

### 10.3.4 Instrument Standardization

- Instrument Drift (DC offset)
- Standardization Procedures
- Abbreviated Standardization Checks
- Instrument Response to a Known Standard

### 10.3.5 Data Processing, Correction and Analysis

- Instrument Drift Correction
- Diurnal Drift Correction
- Digital Filtering and Enhancement
- Correlation With Ground Truth

### 10.3.6 Quantitative Interpretation and Dig Sheet Development

### 10.3.7 Anomaly Reacquisition

### 10.3.8 Feed-Back Process (Comparison of dig-sheet predictions with ground-truth)

### 10.3.9 Quality Control

### 10.3.10 Corrective Measures

### 10.3.11 Records Management

### 10.3.12 Interim Reporting

### 10.3.13 Final Reports and Maps

## 10.4 Geophysical Investigation Performance Goals.

10.4.1 OE Detection. Function 1 shows criteria the Contractor must meet when using magnetometry. Function 2 shows criteria the Contractor must meet when using electromagnetic geophysical detection methods. The function used for determining acceptable performance depends upon the geophysical equipment selected and justified by the Contractor. There may be no more than one "miss", per each 100 UXO recovered, of a UXO above the performance line, in order to meet performance criteria. (This corresponds to a 99%, or better, detection rate.) A "miss" is defined to mean buried or surface UXO that lies above and to the right of the line described by the function, that was not identified on the "dig-sheet" provided by the Contractor.

$$\log(d) = 1.354 \log(\text{dia}) - 2.655$$

$$\log(d) = 1.002 \log(\text{dia}) - 1.961$$

(Function 1 - magnetometry)

(Function 2 - electromagnetics)

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dia = diameter of minor axis of UXO, in millimeters.

d = required depth of detection to top of buried UXO, in meters.

[Note: To confirm the calculation is performed correctly, use "105 mm" as the diameter in Function 1. This will result in a required detection depth of 1.2 meters (4.0 ft) for a ferromagnetic projectile of that diameter.]

Minimum UXO "dia" (diameter) must be determined on a project-specific basis and will be specified in the Scope of Work.

10.4.1.1 Performance Goal Modification: It is possible that the specified performance goals cannot be met at this site. If the contractor believes these goals cannot be achieved, then he shall propose and document alternative goals for the Contracting Officer's consideration. The contractor will not be held liable for technically unachievable goals, as determined during the initial phase of field work.

10.4.2 Horizontal Accuracy. Horizontally, 98% of all excavated items must lie within a 20 cm. radius of their mapped surface location as marked in the field after reacquisition.

10.4.3 False Positives. There shall be no more than 15% "false positives" where anomalies reacquired by the Contractor result in no detectable, metallic material during excavations.

10.5. Test Plot. The Contracting Officer may require that the Contractor demonstrate and document the capabilities of the proposed sensors, navigation equipment, data analysis, data management and associated equipment and personnel to operate as an integrated system capable of meeting project performance goals. When the Contracting Officer requires a site-specific geophysical prove-out, a Work Plan that includes test plot design shall be prepared and implemented.

### **10.6. Geophysical Mapping Data.**

10.6.1 The Contractor shall correlate all sensor data with navigational data based upon a local first-order control point. If a suitable point is not available, the Contractor shall have a first-order point shot in. All sensor data shall be preprocessed for sensor offsets, diurnal magnetic variations, etc. and correlated with navigation data. Diurnal magnetic variations measured at a base-station must be collected at approximately the same frequency that readings are collected by instruments used by field crews. The approved geophysical mapping technology shall digitally capture the instrument readings into a file coincident with the state grid coordinates. This field data shall be checked, corrected and processed into ASCII files in the ADF file format. Corrections such as for navigation, instrument bias, and diurnal magnetic shift shall be applied but there shall be no filtering or normalization of the data. All corrections shall be documented. Grids geophysically mapped shall be exactly coincident with the grid system used by the UXO removal action contractor and shall use exactly the same datum and coordinate system. However the geophysical contractor may choose to provide geophysical data files in grids of up 200 ft. x 200 ft. square. The data shall be presented in delineated fields as x, y, z where x and y are local State Grid Plane Coordinates in East and North and z is the instrument reading. Each data field shall be separated by a space (not a comma). There shall be no header or other information included in the file. No individual file may be more than 4 megabytes in size and no more than 60,000 lines long. Each grid of data shall be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel. The formats specified in this paragraph are REQUIRED to be exactly followed, although the contractor may choose to submit the data in additional formats as well. No later than 36 hours after collection, the Contractor shall furnish each day's data to CEHNC, via internet using FTP or other approved method, for inspection. Such data is considered to be in draft form. The Contractor shall also provide a digital planimetric map, in Intergraph .DGN format, and coincident with the location of the geophysical survey, that each day's geophysical data set can be registered within. Within 14 days of completion of survey activity The Contractor shall provide CEHNC all final geophysical maps, dig-sheets and supporting geophysical interpretations. All geophysical data shall be accompanied by a Microsoft Word 6.0 file documenting the field activities associated with the data, and the processing performed. The Government will periodically load the geophysical data provided by the Contractor onto a CEHNC Intergraph Workstation for a validation check to assure positional accuracy, proper instrument calibration or other analysis.

10.6.2 Geophysical Data Analysis, Field Reacquisition and Reporting. The Contractor shall analyze the geophysical data and provide "dig-sheets" containing, as a minimum, the following information:

- Project Site
- Geophysical Contractor
- Responsible Geophysicist

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- Grid Number
- Anomaly Number
- Predicted Easting & Northing
- Predicted Depth to Top of Item

The dig sheets shall be provided to CEHNC as hard copy maps and digitally.

10.6.3 Anomaly Reacquisition and Marking. The Contractor shall use precision surveying methods of their choice to reacquire all geophysical anomalies identified on the dig sheets. The Contractor shall flag the actual field location of each identified anomaly shown on the "dig-sheet" and paint the ground at the flag location with high-visibility paint. Such reacquisition shall be carried out concurrently with other site activities and shall be completed no later than 14 days after field investigations are completed. The Contractor shall record and report on all discrepancies between original mapped locations of anomalies as shown on the dig-sheet, and actual locations of the reacquired location. The Contractor shall also report any anomalies that could not be reacquired.

10.6.4 Anomaly Excavation Reporting. The Contractor shall, in full accordance with the project work plan, excavate the anomalies identified on the dig-sheets, reacquired, and marked in the field. The disposition of each anomaly shall be recorded in accordance with CEHNC OE-CX requirements.